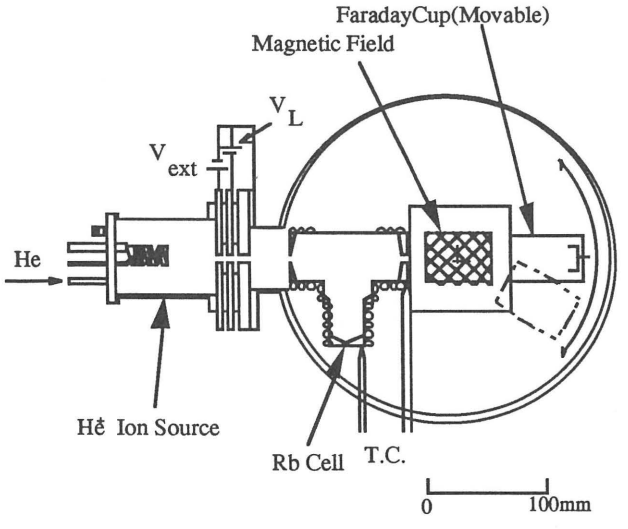
§4. Development of an He^- Source for a Diagnostic Beam of Alpha Particle Measurement

Taniike, A., Sasao, M.,
Wada, M.(Doshisha Univ.)

A double-charge exchange type of He^- source using a Rb gas cell is under development for the purpose of application to the alpha-particle measurement. In Fig.1 is shown the schematics of the setup used for the He^- extraction experiment. A beam of He^+ is extracted from an 8.5 cm-diam 10 cm-long compact multicusp ion source by a 6 mm-diam three-electrode-extraction-structure. It passes through the 1 cm-daim entrance aperture of the charge exchange cell of Rb. The He^- beam produced in the charge exchange cell is detected with a Faraday cup after the charge separation by a pair of permanent magnets.

Because a high conversion efficiency is expected at relatively low beam energy (~7 keV) in Rb, dispersion of a beam is a serious problem. The gap distance of the first acceleration electrode has been increased up to 9 mm to obtain the maximum He^+current. In Fig. 2 is shown the He^+current as a function of deceleration voltage for the discharge current of 1A, 2A, and 3A.

Line emissions in the Rb-cell is contiumuously monitored, as shown in Fig.3. Transition lines from n=3 to n=2 of both He(g, ^1S) and He(m, ^3S) are observed (Fig. 3), indicating the optimum beam energy for He^- production (Fig. 4).



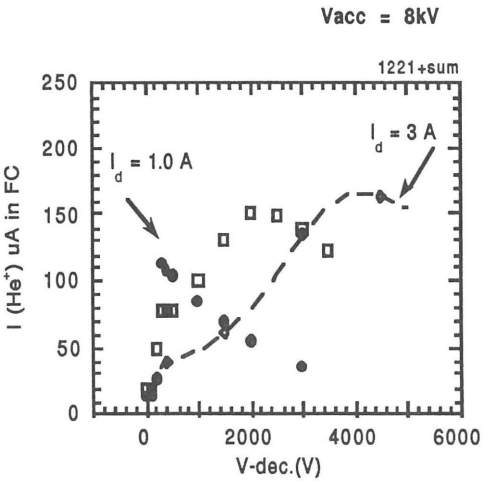


Fig. 2 Extracted He^+ beam current

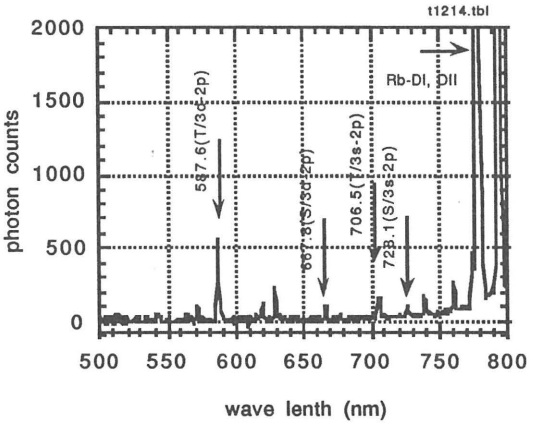


Fig. 3 Line emissions in the Rb-cell. Rb vapor pressures can be monitored by Rb- DI,DII intensity, and the lines of 587.6 nm and 706.5 are showing the metastable He atoms in the cell.

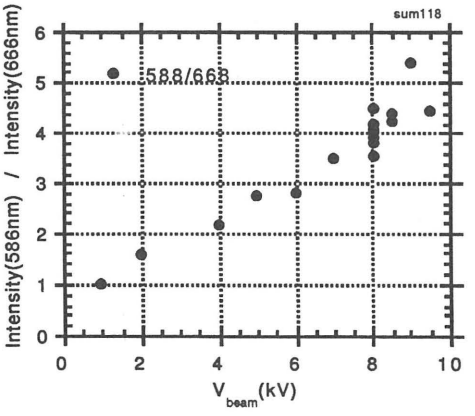


Fig.4 The line ratio of transitions from n=3 -->2 of He(m, ^3S) to that of He(g, ^1S) .